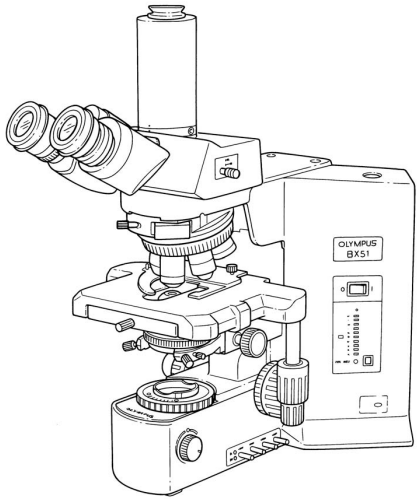
OLYMPUS®



INSTRUCTIONS

BX51/BX52

SYSTEM MICROSCOPE

This instruction manual is for the Olympus System Microscopes Models BX51 and BX52. To ensure the safety, obtain optimum performance and to familiarize yourself fully with the use of this microscope, we recommend that you study this manual thoroughly before operating the microscope. Retain this instruction manual in an easily accessible place near the work desk for future reference.

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CONTENTS

Correct assembly and adjustments are critical for the microscope to exhibit its full performance. If you are going to assemble the microscope yourself, please read section 7, "ASSEMBLY" (pages 28 to 30) carefully.

IMPORTANT – Be sure to read this section for safe use of the equipment. 1-3

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■ **PROPER SELECTION OF THE POWER SUPPLY CORD** 31-32

IMPORTANT

This microscope employs a UIS2/UIS (Universal Infinity System) optical design, and should be used only with UIS2/UIS eyepieces, objectives and condensers for the BX2 series. (Some of the modules designed for the BX series and objectives/eyepieces for the UIS series are also usable. For details, please consult Olympus or the catalogues.) Less than optimum performance may result if inappropriate accessories are used.

⚠ SAFETY PRECAUTIONS (Fig. 1)

1. After the equipment has been used in an observation of a specimen that is accompanied with a potential of infection, clean the parts coming in contact with the specimen to prevent infection.
   - Moving this product is accompanied with the risk of dropping the specimen. Be sure to remove the specimen before moving this product.
   - In case the specimen is damaged by erroneous operation, promptly take the infection prevention measures.
   - The product becomes unstable if its height is increased by an accessory mounted on it. In this case, take anti-toppling measures to prevent the specimen from being dropped when the product topples down.
2. Install the microscope on a sturdy, level table or bench so as not to block the air vents on the underside of the base.
   Do not place the microscope on a flexible surface, as this could result in blocking the air vents and cause overheating or a fire.
3. The surfaces of the lamp housing on the rear of the microscope will become extremely hot during operation. When installing the microscope, make sure to allow ample free space (10 cm or more) around and in particular above the lamp housing.
4. When installing the microscope, route the power cord away from the lamp housing. Should the power cord come in contact with the hot lamp housing, the power cord could melt and cause electric shock.
5. To avoid potential shock hazards and burns when replacing the light bulb, set the main switch ① to " O " (OFF) then disconnect the power cord from the wall outlet in advance. Whenever you replace the bulb during use or right after use, allow the lamp housing, and bulb to cool before touching. (Fig. 1)

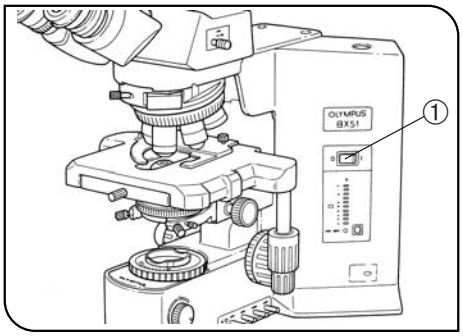


Fig. 1

Designated bulb	12V100WHAL (PHILIPS 7724) 12V50WHAL-L (LIFE JC)

★ The microscope also incorporate a fuse (this should be replaced by the manufacturer or an authorized agent).

6. Always use the power cord provided by Olympus. If no power cord is provided, please select the proper power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, product safety performance cannot be warranted.
7. Always ensure that the **grounding terminal** of the microscope and that of the wall outlet are properly connected. If the equipment is not grounded, Olympus can no longer warrant the electrical safety performance of the equipment.
8. Never insert metallic objects into the air vents of the microscope frame as this could result in electrical shock, personal injury and equipment damage.

Safety Symbols

The following symbols are found on the microscope. Study the meaning of the symbols and always use the equipment in the safest possible manner.

Symbol	Explanation
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper use could result in personal injury to the user and/or damage to the equipment.
I	Indicates that the main switch is ON.
O	Indicates that the main switch is OFF.

Warnings

Warning engraving is placed at parts where special precaution is required when handling and using the microscope. Always heed the warnings.

Warning engraving position	Lamp housing (Warning against high temperature)

1 Getting Ready

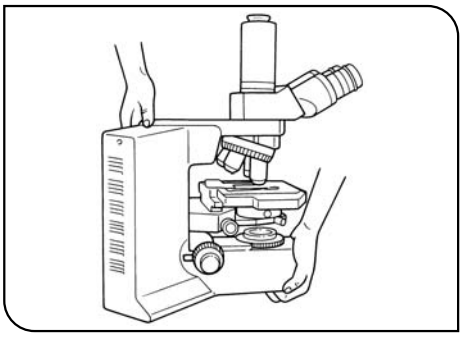


Fig. 2

1. A microscope is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.
2. Do not use the microscope where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations. (For the operating conditions, refer to section 5, "SPECIFICATIONS".)
3. When moving the microscope, remove the specimen and modules that may drop during transport and carefully carry it with the grasping part on the rear of the arm and the base as shown in Fig. 2 (Weight: approx. 16 kg).

★ If a module such as a photographic device is installed, the microscope system will be very heavy. Remove the intermediate attachment before carrying.

★ Damage to the microscope will occur if you grasp it by the stage, coarse/fine adjustment knob or binocular section of the observation tube.

4. The BX51/52 series can be used with up to two intermediate attachments (e.g. a U-CA magnification changer, U-EPA2 eyepoint adjuster, etc.). For restrictions when using two intermediate attachments, make sure to read the instruction manual provided with the respective intermediate attachments.

★ The microscope may become unstable when its height is increased by mounting certain modules on it. In such a circumstance, take measures to prevent the microscope from toppling down and dropping the specimen.

2 Maintenance and Storage

1. Clean all glass components by wiping gently with gauze. To remove fingerprints or oil smudges, wipe with gauze slightly moistened with a mixture of ether (70%) and alcohol (30%).

⚠**Since solvents such as ether and alcohol are highly flammable, they must be handled carefully. Be sure to keep these chemicals away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off. Also remember to always use these chemicals only in a well-ventilated room.**

2. Do not attempt to use organic solvents to clean the microscope components other than the glass components. To clean them, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.
3. Do not disassemble any part of the microscope as this could result in malfunction or reduced performance.
4. When not using the microscope, keep it covered with a dust cover.

3 Caution

If the microscope is used in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the equipment may also be damaged. Always use the equipment as outlined in this instruction manual.

The following symbols are used to set off text in this instruction manual.
⚠ : Indicates that failure to follow the instructions in the warning could result in bodily harm to the user and/or damage to equipment (including objects in the vicinity of the equipment).
★ : Indicates that failure to follow the instructions could result in damage to equipment.
◎ : Indicates commentary (for ease of operation and maintenance).

This device complies with the requirements of directive 98/79/EC concerning in vitro diagnostic medical devices. CE marking means the conformity to the directive.

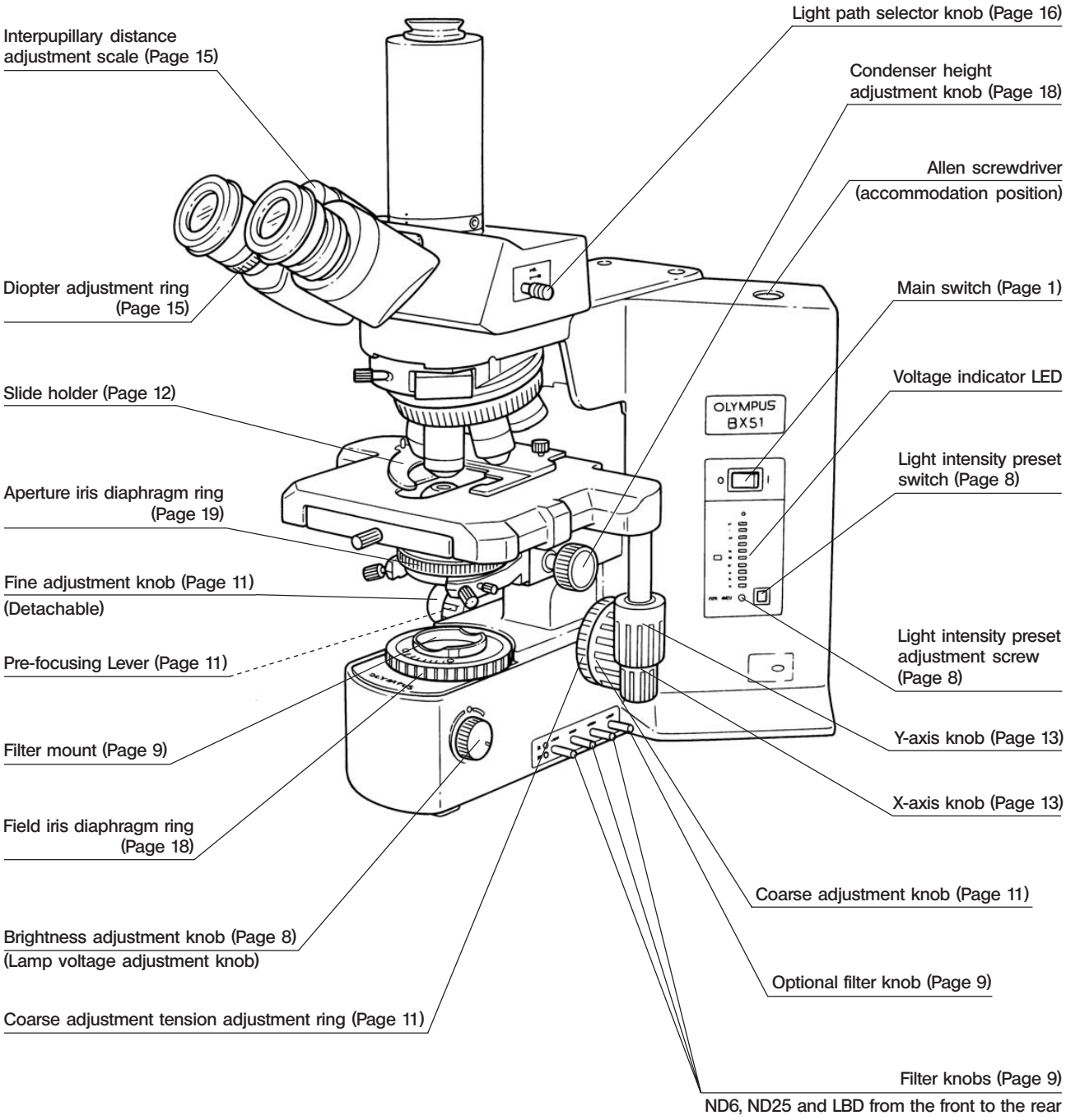
NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1 NOMENCLATURE

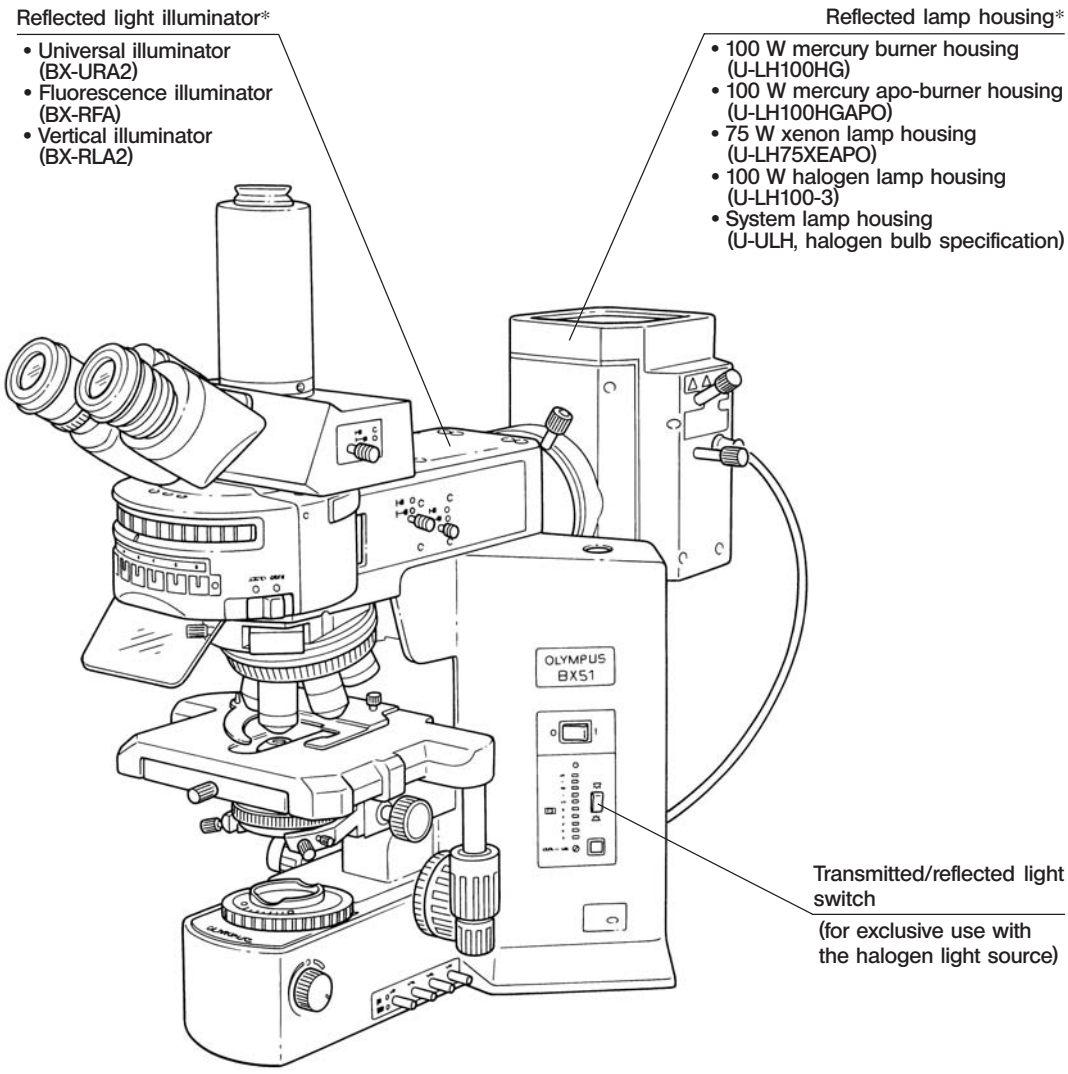
◎ If you have not yet assembled the microscope, read section 7, "ASSEMBLY" (pages 28 to 30).

Transmitted light specification models | BX51TF or BX52TF microscope frame


Interpupillary distance adjustment scale (Page 15)
Diopter adjustment ring (Page 15)
Slide holder (Page 12)
Aperture iris diaphragm ring (Page 19)
Fine adjustment knob (Page 11) (Detachable)
Pre-focusing Lever (Page 11)
Filter mount (Page 9)
Field iris diaphragm ring (Page 18)
Brightness adjustment knob (Page 8) (Lamp voltage adjustment knob)
Coarse adjustment tension adjustment ring (Page 11)
Light path selector knob (Page 16)
Condenser height adjustment knob (Page 18)
Allen screwdriver (accommodation position)
Main switch (Page 1)
Voltage indicator LED
Light intensity preset switch (Page 8)
Light intensity preset adjustment screw (Page 8)
Y-axis knob (Page 13)
X-axis knob (Page 13)
Coarse adjustment knob (Page 11)
Optional filter knob (Page 9)
Filter knobs (Page 9)
ND6, ND25 and LBD from the front to the rear
OLYMPUS
BX51

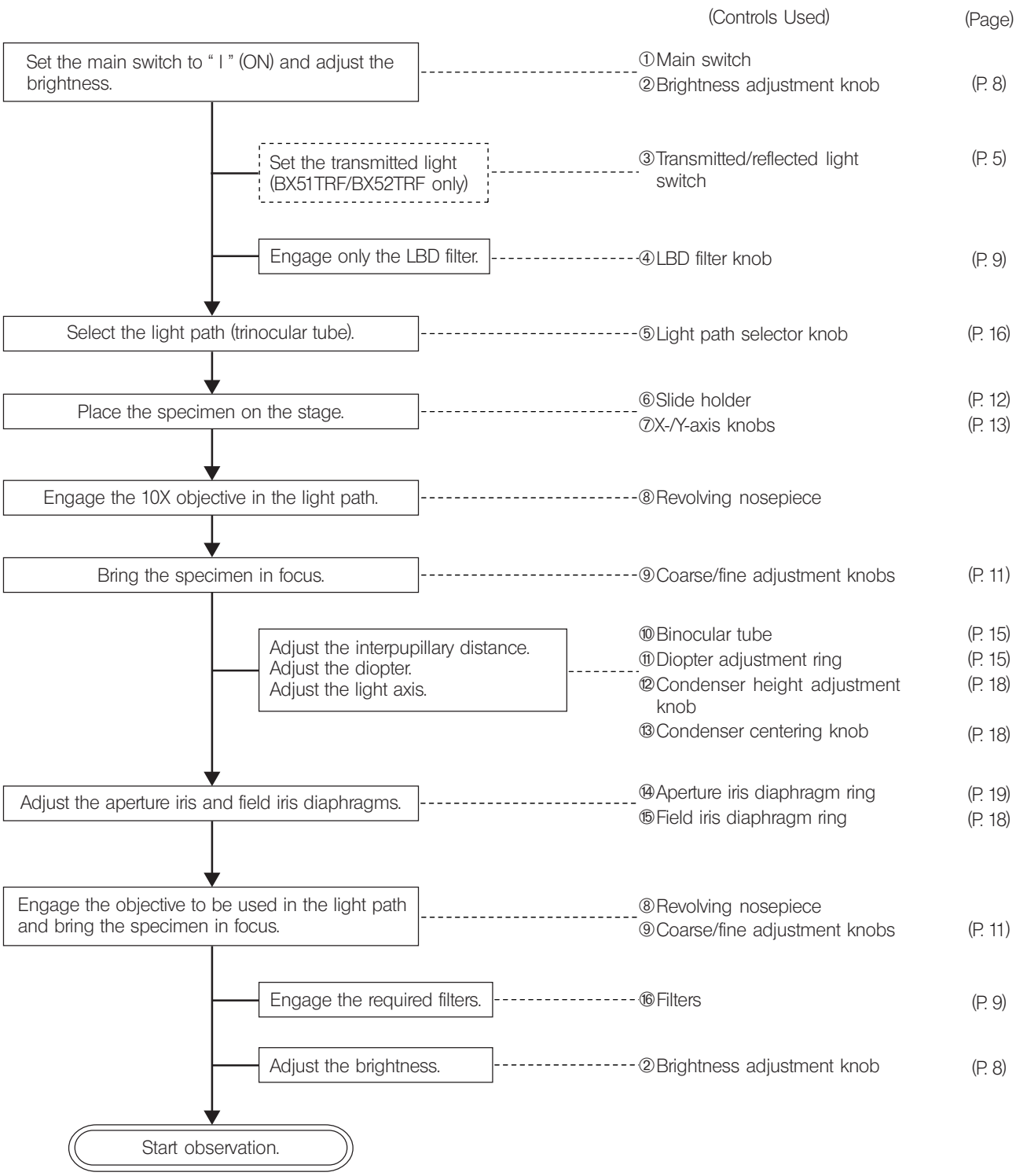
Transmitted light/reflected light specification models BX51TRF and BX52TRF microscope frames

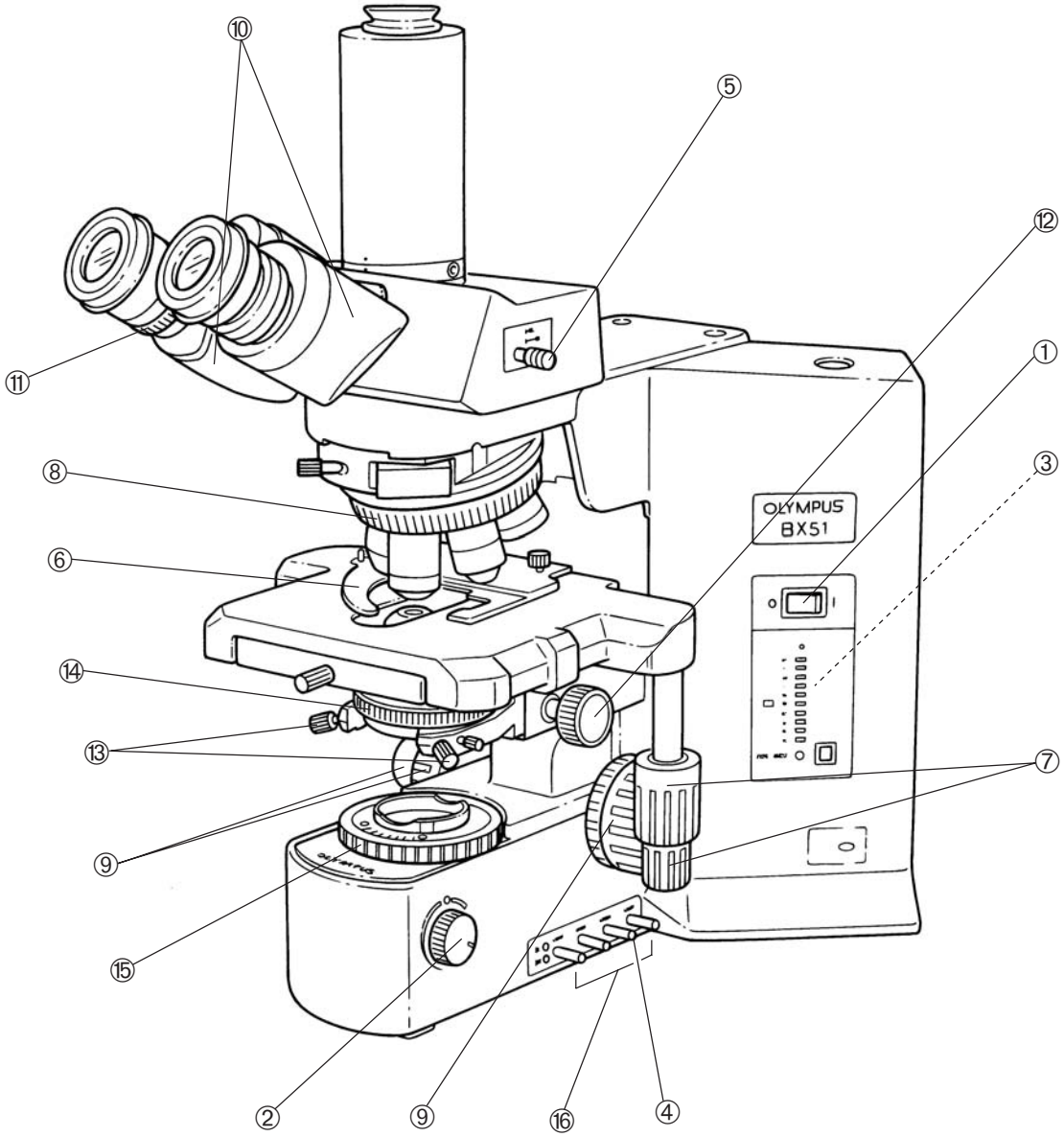
NOTE The controls are identical to those of the transmitted light specification models except for the transmitted/reflected light switch and the reflected light system (vertical illuminator, reflected lamp housing).


Reflected light illuminator*
• Universal illuminator (BX-URA2)
• Fluorescence illuminator (BX-RFA)
• Vertical illuminator (BX-RLA2)
Reflected lamp housing*
• 100 W mercury burner housing (U-LH100HG)
• 100 W mercury apo-burner housing (U-LH100HGAPO)
• 75 W xenon lamp housing (U-LH75XEAPO)
• 100 W halogen lamp housing (U-LH100-3)
• System lamp housing (U-ULH, halogen bulb specification)
OLYMPUS BX51
Transmitted/reflected light switch
(for exclusive use with the halogen light source)

* For the reflected illuminators and reflected lamp housings, please also refer to their instruction manuals.

2 TRANSMITTED LIGHT BRIGHTFIELD OBSERVATION PROCEDURE





© Copy the observation procedure pages on separate sheets and post it near your microscope.

3 USING THE CONTROLS

3-1 Base

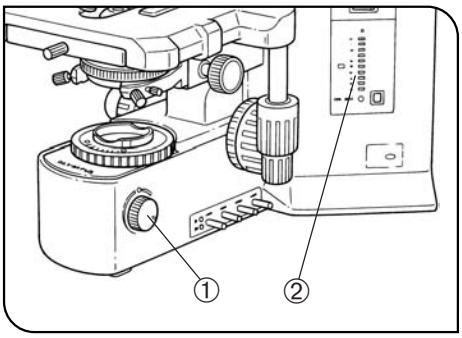


Fig. 3

1 Voltage Indication (Fig. 3)

1. Turn the brightness adjustment knob ① clockwise to increase the voltage and make illumination brighter.
2. The numerals to the right of the lamp voltage indicator LEDs ② indicate the voltage.

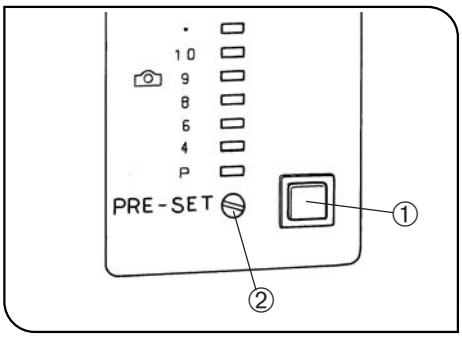


Fig. 4

2 Using the Light Intensity Preset Switch (Fig. 4)

◎The light intensity preset switch ① makes it possible to limit the light intensity to a preselected level regardless of the position of the brightness adjustment knob.
The light intensity preset has been preset to optimum brightness for photography when the built-in LBD filter is engaged (approx. 9 V with 📷 marking).

1. Press the light intensity preset switch ① to the ON position. (The face of the switch lights when it is ON.)
2. Using a small flat-blade screwdriver, turn the preset adjustment screw ② to obtain the required light intensity. Turning the screw clockwise increases brightness.
3. When the light intensity preset switch is set to OFF, the brightness returns to the level set by the brightness adjustment knob.

★**While the light intensity preset switch is ON, turning the light brightness adjustment knob does not affect brightness.**

3 Using the Filters (Figs. 5 - 10)

◎You can place a filter in the light path with one of the following methods.

- Push in the knob of the desired built-in filter to engage it in the light path. (Page 9)
- Place a filter on the filter mount on the base and engage in the light path. (Page 9)
- Insert a filter in the U-FC filter cassette, attach it on the filter mount and engage it in the light path by sliding the filter lever. (Page 9)

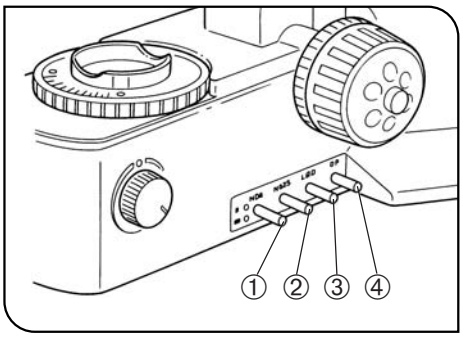


Fig. 5

Using Built-In Filters (Fig. 5)

Each of filter knobs ① to ④ can be engaged into the light path by pressing the knob in. Pressing the button again disengages the filter from the light path.

	Filter Type/Purpose
①	ND6 (Neutral Density filter for light adjustment, transmittance 6%)
②	ND25 (Neutral Density filter for light adjustment, transmittance 25%)
③	LBD (for color balancing, daylight filter)
④	OP (optional) filter set*

* Ask your Olympus representative to mount the filters.

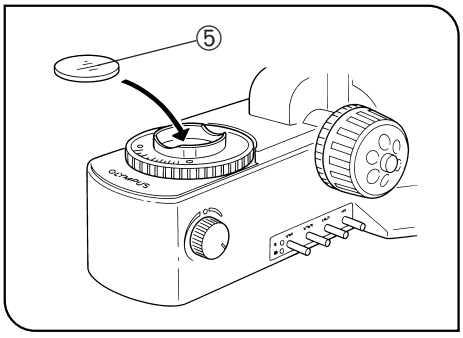


Fig. 6

Mounting a Single Filter (Fig. 6)

A filter with a diameter of 45 mm ⑤ can be placed on the filter mount on the base. If you need to place multiple filters, please purchase the U-FC filter cassette.

★ Even when a filter cassette is used, a filter with thickness of no more than 3 mm can still be placed on the filter mount.

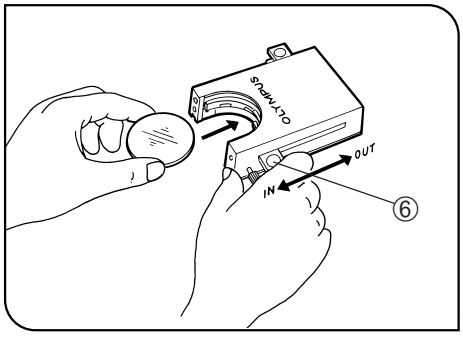


Fig. 7

Using the Filter Cassette (Figs. 7 - 10)

Loading Filters into Filter Cassette

◎The filter cassette accommodates filters with a diameter of 45 mm and thickness of 2.7 mm or less.

◎The filter cassette has two filter levels on the right side and one on the left side.

1. Move all filter levers to the OUT position except for the one belonging to the slot into which the filter is to be inserted.
2. Slide the lever ⑥ to the IN position. Make sure that it clicks securely into place. (Fig. 7)
3. Holding the lever in the position shown in Fig. 7, put the filter into the cassette by inserting it in the direction indicated by the arrow.
4. Insert the other two filters in the same manner.

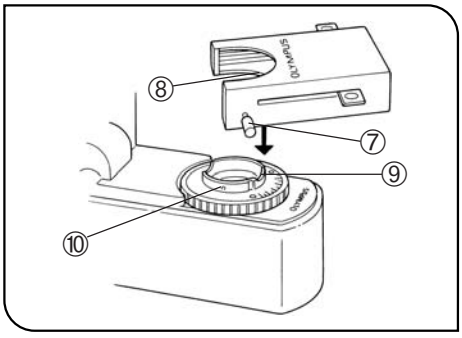


Fig. 8

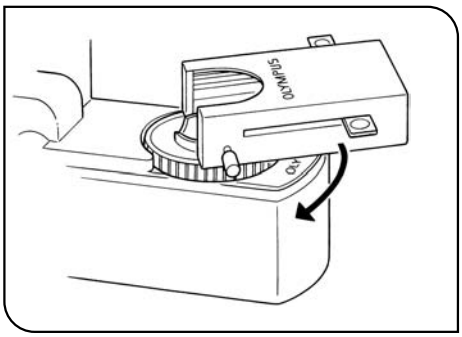


Fig. 9

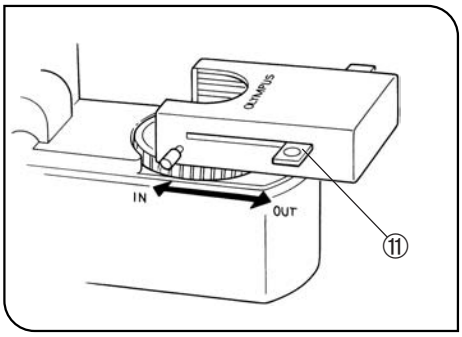


Fig. 10

Mounting the Filter Cassette

1. Fully loosen the filter cassette clamping screw ⑦. (Fig. 8)
2. Align the key ⑧ on the bottom surface of the filter cassette with the positioning slot ⑨ on the filter mount, then snap the filter cassette into place from above.
3. Rotate the filter cassette to align its sides with the base. (Fig. 9)
4. Align the clamping screw ⑦ with the positioning hole ⑩ on the filter mount, then tighten the screw to fasten the filter cassette.

★ **When the filter cassette is installed, the stage may hit it when lowered. Therefore, exercise caution when lowering the stage with the filter cassette installed.**

Using the Filter Cassette (Fig. 10)

Usable Filters	Applications	
45ND-6, 45ND-25	Neutral density filter	
45G-530, 45G-533, 45IF550	Green	B&W contrast filter
45Y-48	Yellow	
45O-560	Orange	

Up to three of the above filters can be loaded in the filter cassette. Moving the levers ⑪ on the left and right sides of the cassette to the IN position brings the corresponding filter into the light path.

3-2 Focusing Block

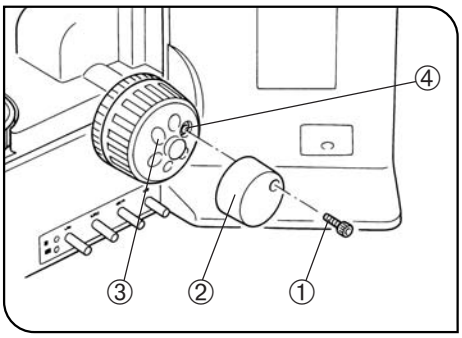


Fig. 11

1 Replacing the Fine Adjustment Knob (Fig. 11)

★The fine adjustment knob has been attached on the right side at the factory.

◎The fine adjustment knob is designed detachable to prevent interference with hand during manipulation of the fine adjustment knob or X-/Y-axis knobs.

Usually attach the knob on the opposite side to the X- and Y-axis knobs.

1. Using the Allen screwdriver, loosen the clamping screw ① and remove the fine adjustment knob ②.
2. Remove the seal from the fine adjustment knob screw hole on the other side and attach the knob by reversing the removal procedure.
3. Attach a provided seal on the screw hole ④ of the removed fine adjustment knob.

◎The fine adjustment dial ③ can be operated with your fingertip or finger surface at the same time as manipulating the X- or Y-axis knob.

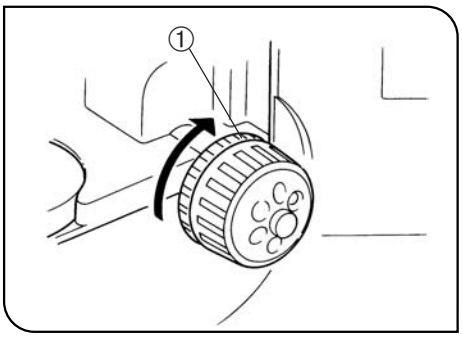


Fig. 12

2 Adjusting the Coarse Adjustment Knob Tension (Fig. 12)

★Adjust the coarse adjustment knob tension using the tension adjustment ring ①.

The coarse adjustment knob tension is preadjusted for easy use. However, if desired, you can change the tension using the tension adjustment ring ①. Turning the ring in the direction of the arrow increases tension, and vice versa.

The tension is too low if the stage drops by itself of focus is quickly lost after adjustment with the fine adjustment knob. In this case, turn the ring in the direction of the arrow to increase tension.

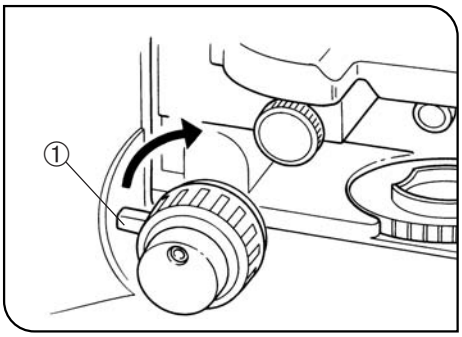


Fig. 13

3 Pre-focusing Lever (Fig. 13)

◎The pre-focusing lever ensures that the objective does not come in contact with the specimen and simplifies focusing.

After focusing on the specimen with the coarse adjustment knob, turn this lever ① in the direction of the arrow and lock; the upper limit on coarse adjustment movement is set at the locked position.

After changing a specimen, refocusing is easily accomplished by rotating the coarse adjustment knob to reach the pre-focused position, then making fine adjustments with the fine adjustment knob.

◎Stage movement with the fine adjustment knob is not locked.

★When the pre-focusing lever is locked, a coarse movement stroke is reduced due to the microscope's mechanism, causing the stage not to be able to be lowered to the lower limit. To lower the stage to the lower limit, release the pre-focusing lever.

3-3 Stage

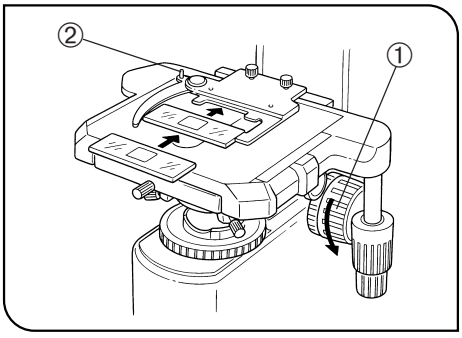


Fig. 14

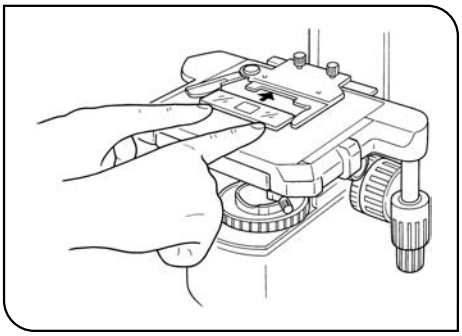


Fig. 15

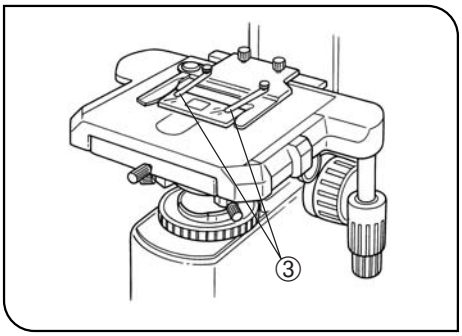


Fig. 16

1 Placing the Specimen

★ **The dimensions of the slide glass should be 26 x 76 mm with thickness of 0.9 to 1.2 mm, and the cover glass should have thickness of 0.17 mm.**

★ **When observing very large specimens, remove the slide holder and place the specimen directly on the stage.**

Microscopy with Double-Slide Holder (Fig. 14)

1. Turn the coarse adjustment knob ① to lower the stage.
2. Open the spring-loaded curved finger ② on the slide holder and place one or two specimen slides on the stage from the front.
3. After placing the sides as far as they will go, gently release the curved finger.

Microscopy with Single-Slide Holder (Fig. 15)

The specimen side can easily be placed by sliding it into the slide holder from the front.

Using an Oil Immersion Objective

Adsorption of immersion oil can cause the specimen to drift. In such cases, it is recommended to use the optional BH2-SCB-3 specimen clip ③ for oil immersion objectives. (Fig. 16)

Using an Oil Immersion Condenser

It may be effective to use the optional U-SVRO (right-hand knob) or U-SVLO (left-hand knob) slotted stage which prevents close contact between the specimen and stage.

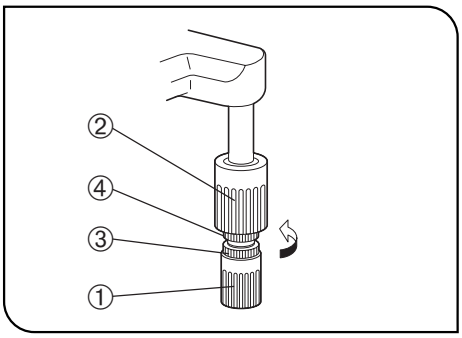


Fig. 17

2 Adjusting the X- and Y-Axis Knob Tension (Fig. 17)

1. Hold the X-axis knob ① and slide up the Y-axis knob ② up to expose the adjustment knobs.
2. Turning the X-axis adjustment knob ③ or Y-axis adjustment knob ④ clockwise (in the direction of the arrow) increases the tension and counterclockwise decreases it.

★**If the tension is adjusted to tight, a creaking sound may be heard during stage travel, and the stage stopping accuracy may be imperiled.**

CAUTION **After long hours of use, the stage guide may be deviated and the stage travel range may be decreased. However, this is not malfunction and can be corrected easily as described below.**

[Treatment]

Horizontal direction: Hold the specimen holder and move the stage guide to the left and right so that it hits the stoppers.

Vertical direction: Hold the upper stage and move it to the front and rear so that it hits the stoppers.

Stage Feed Knob Rubber Caps (Optional)

◎When the X- and Y-axis knobs are fitted with the rubber caps, the knobs can be adjusted without slipping and fine adjustment is possible by holding the knobs with a very light force. The knob rubber caps also reduce fatigue after long hours of operation.

The U-SHGT thick type (thickness 5 mm) and U-SHG thin type (thickness 2 mm) knob rubbers are available.

To attach the knob rubbers:

First fit the larger knob rubber to the Y-axis (upper) knob from below it, then fit the smaller knob rubber to the X-axis (lower) knob from below it.

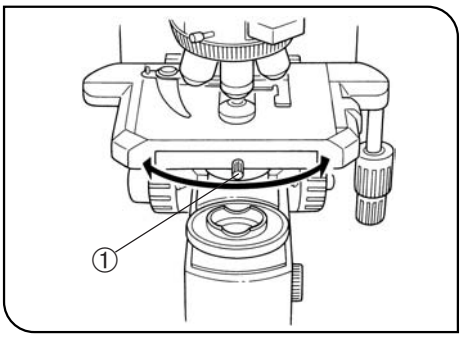


Fig. 18

3 Rotating the Stage (Fig. 18)

1. Slightly loosen the stage clamping screw ①.
2. The stage can be rotated both clockwise and counterclockwise by the stage clamping screw.

★**A click may be heard and felt during rotation. However, this is due to the construction of the substage and does not indicate a malfunction.**

◎The angle of rotation varies depending on the positions of the X- and Y-axis knobs.

	Angle of Rotation	
	Clockwise	Counterclockwise
Right hand knobs	230°	20°
Left hand knobs	20°	230°

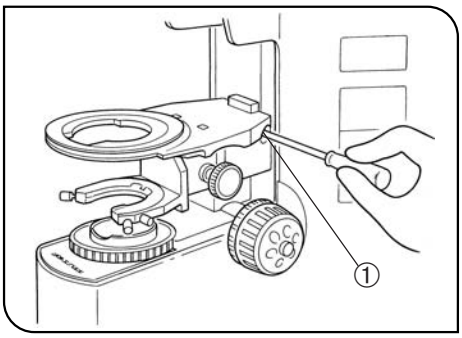


Fig. 19

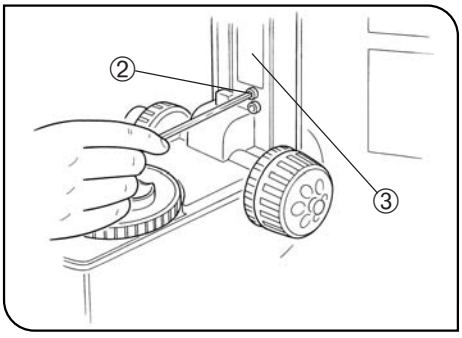


Fig. 20

4 Adjusting the Stage Height (Figs. 19 & 20)

◎By lowering the position of the substage, the microscope will accommodate specimens with maximum height of 35 mm. This is useful when observing metallurgical specimens and other thick objects.

1 Lower the stage to the lower limit, then remove the stage from the microscope.
2 Using the Allen screwdriver, loosen the substage bracket clamping screw ① and remove the substage.
3. Turn the coarse adjustment knob and raise the focusing block ③ to where the stopper screw ② on the arm becomes visible.
4. Using the Allen screwdriver, loosen and remove the upper stopper screw ②.
5. Reattach substage bracket and stage.

3-4 Observation Tube

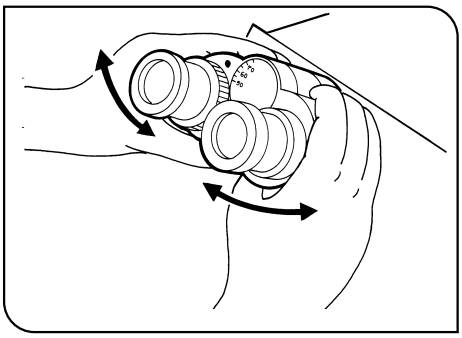


Fig. 21

1 Adjusting the Interpupillar Distance (Fig. 21)

While looking through the eyepieces, adjust for binocular vision until the left and right fields of view coincide completely. The index dot • indicates the interpupillary distance.

◎Note your interpupillary distance so that it can be quickly duplicated.

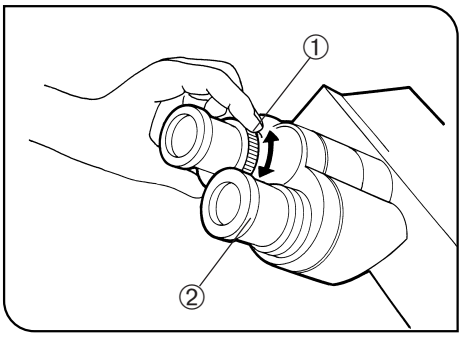


Fig. 22

2 Adjusting the Diopter (Figs 22 & 23)

1. Looking through the eyepiece without the diopter adjustment ring, rotate the coarse and fine adjustment knobs to bring the specimen into focus.
2. Looking through the eyepiece with the diopter adjustment ring, turn only the diopter adjustment ring ① to focus on the specimen. (Fig. 22)

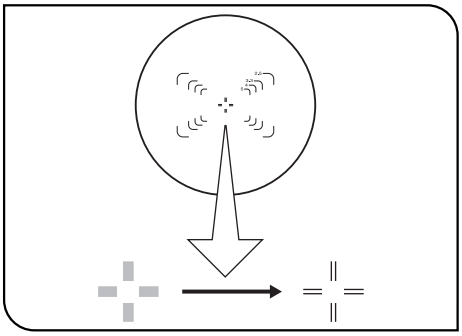


Fig. 23

Using a Finder Eyepiece

1. Looking through the right eyepiece with your right eye, turn the top of the eyepiece ② until a clearly defined double crossline can be seen in the field of view. (Figs. 22 & 23)
2. Looking through the right eyepiece, rotate the coarse and fine adjustment knobs to bring the specimen and double crossline into simultaneous focus.
3. Looking through the left eyepiece with your left eye, turn the diopter adjustment ring ① to focus on the specimen.

Using a Super Widefield Observation Tube

Adjust the diopter as instructed above.
However, since no diopter adjustment ring is provided, turn the top of the eyepiece instead.

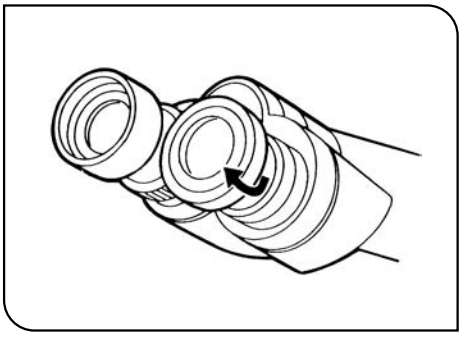


Fig. 24

3 Using the Eye Shades (Fig. 24)

When Wearing Eyeglasses

Use with the eye shades in the normal, folded-down position. This will prevent the eyeglasses from being scratched.

When Not Wearing Eyeglasses

Extend the folded eye shades in the direction of the arrow to prevent extraneous light from entering between the eyepieces and eyes.

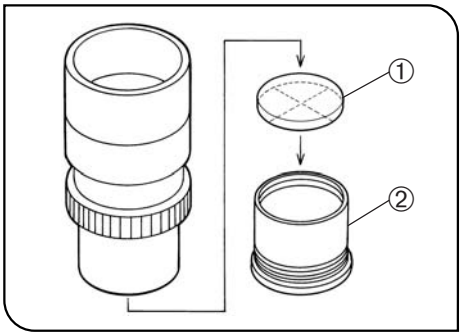


Fig. 25

4 Using the Eyepiece Micrometer Disk (Fig. 25)

When the WHN10X-H (or WHN10X) eyepieces are used, an eyepiece micrometer disk can be inserted in one of them. When the eyepiece does not have a diopter adjustment mechanism, however, it is hard to focus on the micrometer disk if the operator has poor eyesight. Should that be the case, adjust the focus with eyeglasses on.
Use 24 mm dia. x 1.5 mm thick micrometer disks.
Following Fig. 25, turn the built-in micrometer-mounting frame ② counter-clockwise to remove it from the eyepiece and place a micrometer disk. Screw the micrometer mounting frame back into the eyepiece sleeve.

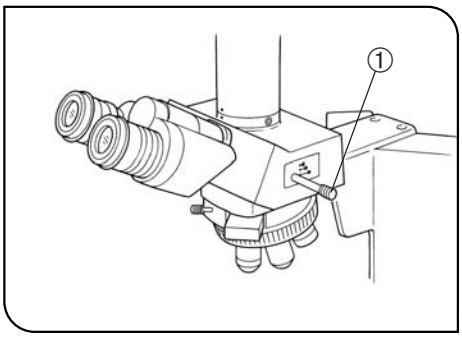


Fig. 26

5 Selecting the Light Path of the Trinocular Tube (Fig. 26)

Slide the light path selector knob ① to select the desired light path.

Trinocular tube	Light path selector knob position		
	Pushed in	Middle position	Pulled out
U-TR30-2	100% for binocular eyepieces	20% for binocular eyepieces, 80% for TV/photography	100% for TV/photography
U-SWTR-3			
U-TR30NIR*		50% for binocular eyepieces, 50% for TV/photography	

*With the infrared trinocular tube, infrared observation up to 1000 nm is possible. For details, consult your Olympus representative.

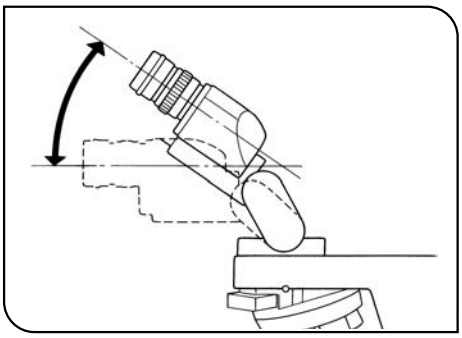


Fig. 27

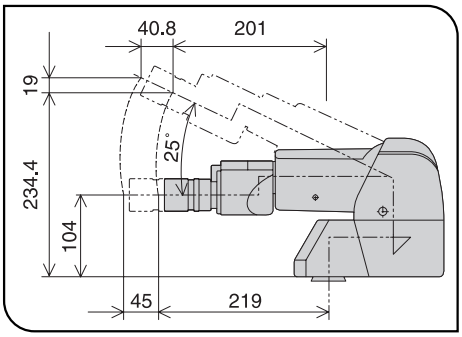


Fig. 28

6 Adjusting the Tilt (with the U-TBI3) (Fig. 27)

◎Adjust the height and tilt of the observation tube to obtain the most comfortable viewing position.
Holding the binocular section with both hands, raise or lower it to the desired position.

★**Never attempt to force the binocular section past the upper or lower stop position. Applying excessive force could destroy the limiting mechanism.**

◎The U-TBI3 can be used in combination with only one intermediate attachment.

◎If you need photography using the U-TBI3, use the U-TRU trinocular tube.

With the U-ETBI/U-TTBI (Fig. 28)

The U-ETBI and U-TTBI are ergonomic observation tubes with normal field, capable of the tilting adjustment as well as the adjustment of the eyepiece position toward the front and rear (by 45 mm). The U-ETBI is the erect image model and the U-TTBI is the inverted image model, and both models are of the same size.

★**The intermediate attachments that can be combined with the U-TTBI are limited. For details, please contact Olympus.**

3-5 Condenser

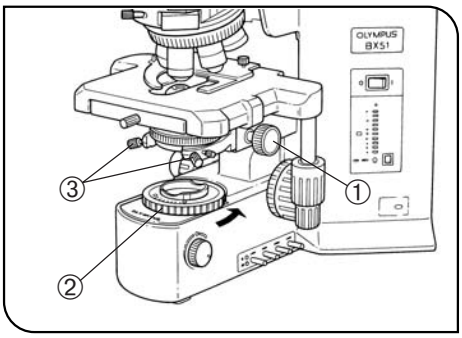


Fig. 29

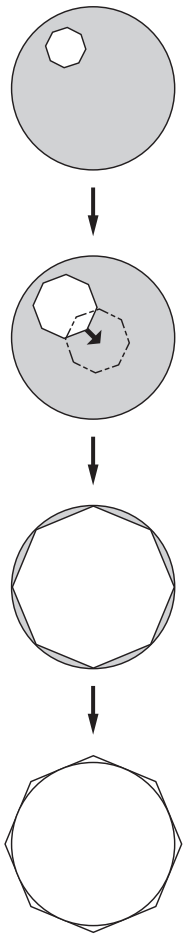


Fig. 30

1 Centering the Condenser (Figs. 29 & 30)

1. Turn the condenser height adjustment knob ① to raise the condenser to its upper limit.
2. Focus on the specimen using the 10X objective.

★ **When using the U-SC3 swing-out condenser, move the top lens into the light path.**

3. Rotate the field iris diaphragm ring ② in the direction of the arrow so that the diaphragm image comes inside the field of view.
4. Manipulate the condenser height adjustment knob ① to focus on the diaphragm image.
5. Turn the two condenser centering screws ③ to move the iris diaphragm image to the center of the field of view.
6. Gradually open the field iris diaphragm. The condenser is properly centered if the iris image is centered and inscribed in the field of view.
7. During actual use, open the field diaphragm slightly until its image circumscribes the field of view.

Effects of Field Iris Diaphragm (Fig. 30)

The field iris diaphragm restricts the diameter of the beam of light entering the objective and thus excludes extraneous light, improving image contrast. The diameter of the field iris should e adjusted for objective power to the extent that it just circumscribes the field of view. (See "Compatibility of Objectives and Condensers" on the next page.)

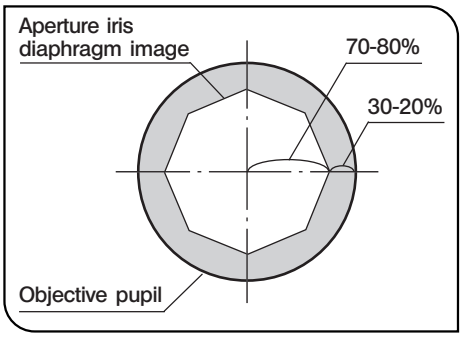


Fig. 31

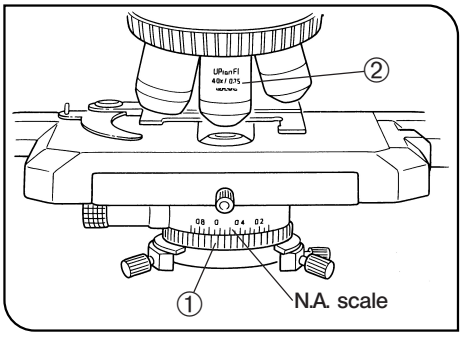


Fig. 32

Aperture Iris Diaphragm (Figs. 31 & 32)

- The aperture iris diaphragm determines the numerical aperture of the illumination system. It has an effect of adjusting image resolution and contrast. Stopping down the aperture iris diaphragm increases the depth of focus.
- Since the contrast of microscope specimens is ordinarily low, setting the condenser aperture iris diaphragm to between 70 and 80% of the N.A. ② of the objective in use is usually recommended.
  Adjust the ratio by removing the eyepiece and looking into the eyepiece sleeve while adjusting the aperture iris diaphragm ring ① until the image shown in Fig. 31 is seen.

◎Using the numerical aperture scale:
You can use the condenser numerical aperture scale by adjusting the aperture iris diaphragm ring ①. (Fig. 32)

2 Compatibility of Objectives and Condensers

Objective Magnification	Condenser			
	Abbe U-AC2	Achromat/aplanat U-AAC	Swing-out U-SC3	Ultralow magnification U-ULC-2
1.25X	Applicable to FN 22	Applicable (FN 26.5) by moving top lens out of the light path* (FN 26.5)	Applicable to FN 22	Applicable (FN 26.5)
2X				
4X				
10-60X	Applicable (FN 26.5)	Applicable (FN 26.5)	Engage top lens in light path (FN 26.5)	
100X				

*When using the U-SC3 swing-out condenser together with a 1.25X to 4X objective, fully open the condenser aperture iris diaphragm and use the field iris diaphragm in the base as aperture diaphragm. With the 1.25X to 2X objectives, the surroundings of the field of view may become dark.

◎To obtain better illumination in photomicrography using a 1.25X to 4X objective, use of the U-ULC-2 is recommended.

3-6 Immersion Objectives

★Be sure to use the provided Olympus Immersion oil.

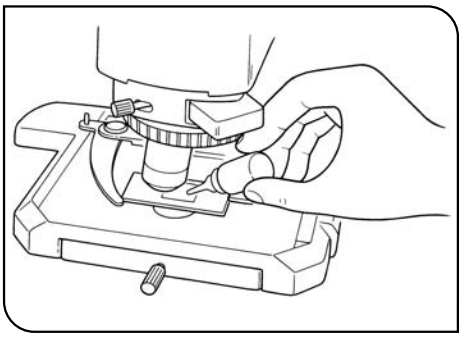


Fig. 33

1 Using Immersion Objectives (Fig. 33)

1. Focus on the specimen with objectives in the order of lower-power to higher-power ones.
2. Before engaging the immersion objective, place a drop of provided immersion oil onto the specimen at the area to be observed.
3. Turn the revolving nosepiece to engage the immersion objective, then focus using the fine adjustment knob.

★Since air bubbles in the oil will affect the image quality, make sure that the oil is free of bubbles.

a. To check for bubbles, remove the eyepiece and fully open the field and aperture iris diaphragms, then look at the exit pupil of the objective inside the observation tube. (The pupil should appear round and bright.)

b. To remove bubbles, turn the revolving nosepiece to repeatedly defocus and refocus the oil immersion objective.

◎If the condenser engraving shows a numerical aperture (NA) of 1.0 or higher, the number applies only when oil is applied between the slide glass and the top surface of the condenser. When oil is not present, the NA is about 0.9.

4. After use, remove oil from the objective front lens by wiping with gauze slightly moistened with an ether (70%)/alcohol (30%) mixture.

⚠Caution in use of immersion oil

If immersion oil enters your eyes or contacts with your skin, immediately take the following treatment.

Eyes: Rinse with fresh water (for 15 minutes or more).

Skin: Rinse with water and soap.

If the appearance of the eyes or skin is altered or pain persists, immediately see your doctor.

3-7 Objectives with Correction Collar

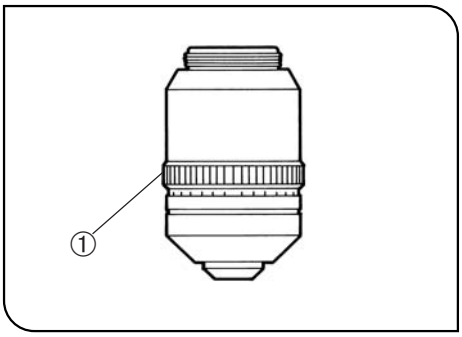


Fig. 34

◎If the cover glass thickness is not 0.17 mm, the objectives cannot manifest their performances. If a correction collar equipped objective is used in this case, the difference in thickness can be compensated for by adjusting the collar.

Adjustment Procedure

- If the cover glass thickness is known, set the correction collar ① to that value. (Fig. 34)
- If the cover glass thickness is unknown, adjust the correction collar ① and fine adjustment knob alternately until the positioning with the highest resolution is obtained.

★Be careful not to touch the correction collar ① when turning the revolving nosepiece.

4 TROUBLESHOOTING GUIDE

Under certain conditions, performance of the unit may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as needed. If you cannot solve the problem after checking the entire list, please contact your local Olympus representative for assistance.

Problem	Cause	Remedy	Page
1. Optical System			
a) Bulb does not light.	Bulb is burned out.	Replace bulb.	29
	Power cord is unplugged.	Plug power cord into the power outlet.	30
	Transmitted/reflected light switch is set to (reflected light). (TRF models only)	Set the switch to (transmitted light illumination).	5
b) Bulb operates, but field of view remains dark.	Aperture and field iris diaphragms are not opened wide enough.	Adjust them to proper sizes.	18/19
	Condenser is lowered too much.	Adjust the condenser height position.	18
	Light path selector knob is set to the position.	Move the knob to the or position.	16
c) Field of view is obscured or not evenly illuminated.	Light path selector knob is in an intermediate position.	Set the knob according to the observation method.	16
	Revolving nosepiece is not correctly engaged.	Make sure that the revolving nosepiece clicks properly into place.	—
	Condenser is not attached properly.	Re-attach it.	29
	Revolving nosepiece is not attached properly.	Push the side dovetail all the way until it is stopped.	—
	An objective that falls outside of the condenser's illumination range is used.	Use a condenser to match the purpose.	19
	Condenser is not properly centered.	Center the condenser.	18
	Field iris diaphragm is stopped down too far.	Open the field iris diaphragm until it circumscribes the field.	18
	Bulb is not mounted correctly.	Push the pins of halogen bulb all the way until the stop position.	29
d) Dirt or dust is visible in the field of view.	Dirt/dust on the eyepiece.	Clean thoroughly.	3
	Dirt or the to surface of the condenser.		
	Dirt/dust on the specimen.		
e) Visibility is poor. • Image is not poor. • Contrast is poor. • Details are indistinct. • Image glares.	A non-UIS2/UIS objective is used.	Use only UIS2/UIS series objectives with this microscope.	26/27
	Condenser is lowered too far.	Adjust the condenser height position.	18
	Aperture iris diaphragm is stopped down too far.	Open aperture iris diaphragm.	19
	Revolving nosepiece is not mounted properly.	Push the slide dovetail all the way until it is stopped.	—
	Correction collar on correction collar equipped objective is not properly adjusted.	While focusing, turn the correction collar to find the best position.	20
	Front lens of objective is dirty.	Clean objective.	3
	Immersion oil is not being used with an oil immersion objective.	Use immersion oil.	20

Problem	Cause	Remedy	Page
e) Visibility is poor. • Image is not poor. • Contrast is poor. • Details are indistinct. • Image glares.	Immersion oil contains bubbles.	Remove the bubbles.	20
	Recommended immersion oil is not used.	Use the provided immersion oil.	20
	Dirt/dust on specimen.	Clean it.	3
	Dirt/dust on condenser.		
	Inappropriate object side or cover glass thickness.	Replace with glass of recommended thickness.	12
f) One side of image is blurred.	Objective is not correctly engaged in light path.	Make sure that revolving nosepiece clicks into place correctly.	—
	Revolving nosepiece is not correctly mounted.	Push slide dovetail all the way until it is stopped.	—
	Stage is not correctly mounted.	Re-attach it.	—
	Specimen is not correctly mounted on stage.	Place specimen correctly on top of stage and secure it with slide holder.	12
g) Image appears to waver.	Revolving nosepiece is not corrected mounted.	Push slide dovetail all the way until it is stopped.	—
	Objective is not correctly engaged in light path.	Make sure that revolving nosepiece clicks into place correctly.	—
	Condenser is not properly centered.	Center the condenser.	18
h) Field of view becomes only slightly brighter when the voltage is raised.	Condenser is not properly centered.	Center the condenser.	18
	Condenser is lowered too far.	Adjust the condenser height position.	18
2. Electrical System			
a) Bulb intermittently lights and goes out.	Bulb is nearly burned out.	Replace bulb.	29
	A connector is not properly connected.	Check all connectors.	—
b) Bulb burns out almost immediately.	Wrong type of bulb is being used.	Use correct bulb type.	29
c) Brightness does not change when you turn light intensity adjustment knob.	Light intensity preset button is set to ON.	Press button to OFF.	8
d) All voltage indicator LEDs light and voltage cannot be varied with light intensity adjustment knob.	Bulb is not installed.	Install bulb.	29
	Bulb is burned out.	Replace bulb.	29
	Lamp socket is not connected.	Connect lamp socket correctly.	29
e) Lamp voltage cannot be varied with light intensity adjustment knob.	Bulb is burned out.	Replace bulb.	29
3. Coarse/Fine Adjustment			
a) Coarse adjustment knob is hard to turn.	Tension adjustment ring is tightened excessively.	Loose ring.	11
	You are trying to raise stage without coarse adjustment knob while pre-focusing lever is kept locked.	Unlock pre-focusing lever.	11
b) Stage drifts down by itself or focus is lost during observation.	Tension adjustment ring is too loose.	Tighten ring.	11

Problem	Cause	Remedy	Page
c) Image cannot be focused.	When adjusting stage height, you forgot to reattach upper stopper screw.	Reattach upper stopper screw.	14
d) Coarse adjustment will not go all the way up.	Pre-focusing lever is locked at a too low height.	Unlock pre-focusing lever.	11
e) Coarse adjustment will not go all the way down.	Condenser holder is too low.	Raise condenser holder.	18
f) Objective makes contact with specimen before focus is obtained.	Specimen is mounted upside down.	Mount specimen correctly.	—
4. Observation Tube			
a) Field of view of one eye does not match that of the other.	Interpupillary distance is incorrect.	Adjust interpupillary distance.	15
	Incorrect diopter adjustment.	Adjust diopter.	15
	Different eyepieces are used on left and right.	Change on eyepiece to match the other so that both sides are the same type.	—
	Your view is not accustomed to microscope observation.	Upon looking into eyepieces, try looking at overall field before concentrating on specimen range. You may also find it helpful to look up and into distance for a moment before looking back into microscope.	—
5. Stage			
a) Image shifts when you touch stage.	Stage is not properly mounted.	Clamp stage.	14
b) Specimen stops midway on the X-axis traverse.	Specimen is not correctly positioned.	Place specimen correctly.	12
c) Horizontal and/or X- and Y-axis knobs are too tight or too loose.	Tension of horizontal and/or X- and Y-axis knobs is too high or too low.	Adjust tension.	13
d) Stroke has reduced.	Stage guide is deviated.	Use treatment method described on page 13.	13

5 SPECIFICATIONS

Item	Specification				
1. Optical system	UIS2/UIS (Universal Infinity System) optical system (featuring infinity correction)				
2. Illumination	Built-in transmitted Koehler illumination 12V, 100W long-life halogen bulb (pre-centered) 12V100WHAL-L (PHILIPS 5761) or 12 V, 50 W long-life halogen bulb (pre-centered) 12V50WHAL-L (LIFE JC) (Average life time: Approximately 2,000 hr. when used as directed) Light intensity voltage range: 2 V or less to 12.0 V DC (continuous) Light intensity preset button (voltage adjustment range: 2 V or less to 12.0 V DC) Rated voltage: 100-120/220-240 V ∿, 1.8/0.8 A, 50/60 Hz Power consumption: 140 W				
3. Focusing	Stage height movement by roller guide (rack & pinion) Stroke per rotation: 0.1 mm (fine), 17.8 mm (coarse) Full stroke range: 25 mm Upper limit stopper Tension adjustment on coarse focus adjustment knob				
4. Revolving nosepiece	Type	U-5RE-2	U-D6RE	U-D7RE	U-P6RE
		5-position revolving nosepiece	Universal 6-position revolving nosepiece	Universal 7-position revolving nosepiece	Universal 6-position centered revolving nosepiece
	Installable modules	None	Transmitted DIC prism, transmitted light analyzer		
5. Observation tube	Type	U-BI30-2	U-TBI3	U-TR30-2 / U-TR30NIR	U-SWTR-3
		Widefield binocular tube	Widefield tilting binocular	Widefield trinocular tube	Super widefield trinocular
	Field No.	22			26.5
	Tube inclination	30°	5°-35° continuous	30°	
	Interpupillary distance adjustment	50 mm to 76 mm			
	Light path selector	None		3 steps: ① BI 100% ② BI 20%, Photo 80% (BI 50%, Photo 50% for U-TR30NIR only) ③ Photo 100%	
6. Stage	Type	U-SVRB-4		U-SVLB-4	
		Common-axis knobs on bottom right		Common-axis knobs on bottom left	
		Rectangular ceramic-coated, wire-driven stage			
	Size	156 mm (D) x 191 mm (W)			
	Movement mechanism	X- and Y-axis knobs with adjustable tension Movement range: 52 mm in vertical (Y) direction, 76 mm in horizontal (X) direction			
	Specimen holders (single slide holder)	U-HLS4 U-HLST4		U-HRS4 U-HRST4	
	Specimen holders (double slide holder)	U-HLD4 U-HLDT4		U-HRD4 U-HRDT4	

Item	Specification			
7. Condenser	Type	U-AC2	U-SC3	U-AAC
		Abbe	Swing-out	Achromat/ Aplanat
	N.A.	1.10	0.9 - 0.1	1.40
	Aperture iris diaphragm	With numerical aperture scale		
	Objective range	4X (for FN 22 widefield), 10X - 100X (for FN 26.5 super widefield)	1.25X (for FN 22 widefield), 2X - 100X (for FN 26.5 super widefield)	10X - 100X (for FN 26.5 super widefield)
8. Operating environment	• Indoor use • Altitude: Max. 2000 meters • Ambient temperature: 5° to 40°C (41° to 104° F) • Maximum relative humidity: 80% for temperatures up to 31°C (88°F), decreasing linearly through 70% at 34°C (93°F), 60% at 37°C (99°F), to 50% relative humidity at 40°C (104°F) • Supply voltage fluctuations; Not to exceed ±10% of the normal voltage • Pollution degree: 2 (in accordance with IEC60664) • Installation/Overvoltage category: II (in accordance with IEC60664)			

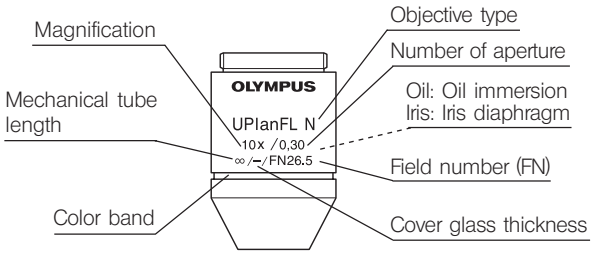
6 OPTICAL CHARACTERISTICS (UIS2/UIS Series)

— UIS series objectives not listed here can also be combined with this microscope. —

The following table shows the optical characteristics of combinations of eyepieces and objectives. The figure on the right shows the performance data engraved on the objectives.

NOTE

Refer to the latest catalogue or consult your local Olympus representative for the updated information on the eyepieces and objectives that can be combined with this microscope.



Objective \ Optical character		Magnification	N.A.	W.D. (mm)	Cover glass thickness	Resolution (μm)	Eyepiece WHN10X (FN22) Total mag.	Depth of focus (μm)	Field of view	Remark
UIS2 Series	PlanN-P Plan Achromat for polarized light (FN22)	4X	0.1	18.5	—	3.40	40X	180.0	5.5	
	AchN-P Achromat for polarized light (FN22)	10X	0.25	6.0	—	1.30	100X	28.0	2.2	
		20X	0.4	3.0	0.17	0.84	200X	9.3	1.1	
		40X	0.65	0.45	0.17	0.52	400X	2.0	0.55	
		100XO	1.25	0.13	0.17	0.27	1000X	0.69	0.22	
	PlanN Plan Achromat (FN22)	2X	0.06	5.8	—	5.59	20X	560.1	11.0	
		4X	0.1	18.5	—	3.36	40X	175.0	5.5	
		10X	0.25	10.6	—	1.34	100X	28.0	2.2	
		20X	0.4	1.2	0.17	0.84	200X	9.27	1.1	
		40X	0.65	0.6	0.17	0.52	400X	3.04	0.55	
		50XOI	0.5-0.9	0.2	0.17	0.37	500X	1.7	0.44	Oil immersion/Iris
		100XO	1.25	0.15	0.17	0.27	1000X	0.69	0.22	Oil immersion
	UPlanFLN Plan Semi Apochromat (FN26.5)	4X	0.13	17.0	—	2.58	40X	127.2	5.5	
		10X	0.3	10.0	—	1.12	100X	22.4	2.2	
		20X	0.5	2.1	0.17	0.67	200X	7.0	1.1	
		40X	0.75	0.51	0.17	0.45	400X	2.52	0.55	
		40XO	1.3	0.2	0.17	0.26	400X	1.27	0.55	Oil immersion
		60X	0.9	0.2	0.17	0.37	600X	1.5	0.37	Correction collar
		60XOI	0.65-1.25	0.12	0.17	0.27	600X	0.98	0.37	Oil immersion/Iris
		100XO	1.30	0.2	0.17	0.26	1000X	0.66	0.22	Oil immersion
		100XOI	0.6-1.30	0.2	0.17	0.26	1000X	0.66	0.22	Oil immersion/Iris
	UPlanSApo Plan Apochromat (FN26.5)	4X	0.16	13.0	—	2.10	40X	99.6	5.5	
		10X	0.4	3.1	0.17	0.84	100X	15.9	2.2	
		20X	0.75	0.6	0.17	0.45	200X	4.29	1.1	
		40X	0.9	0.18	0.17	0.37	400X	2.0	0.55	Correction collar
		60XW	1.2	0.28	0.17	0.28	600X	1.03	0.37	Water immersion
		60XO	1.35	0.15	0.17	0.25	600X	0.89	0.37	Oil immersion
		100XO	1.4	0.13	0.17	0.24	1000X	0.59	0.22	Oil immersion
	PlanApoN Plan Apochromat (FN26.5)	1.25X	0.04	5.0	—	8.39	12.5X	1326.8	17.6	
		2X	0.08	6.2	—	4.19	20X	398.3	11.0	
		60XO	1.42	0.15	0.17	0.24	600X	0.83	0.37	Oil immersion

Objective \ Optical character		Magnification	N.A.	W.D. (mm)	Cover glass thickness	Resolution (μm)	Eyepiece WH10X (FN22)			Remark
							Total mag.	Depth of focus (μm)	Field of view	
UIS Series	UMPlanFl No Cover Plan Semi Apochromat (FN26.5)	40X	0.75	0.63	0	0.45	400X	1.66	0.55	
	MPlanApo No Cover Plan Apochromat (FN26.5)	100XO	1.40	0.10	0	0.24	1000X	0.59	0.22	Oil immersion
	PlanFl Plan Semi Apochromat (FN26.5)	100X	0.95	0.20	0.14-0.20	0.35	1000X	1.0	0.22	Correction collar
	UApo Apochromat (FN22)	20X3/340 20XW3/340 40X3/340 40XW3/340 40XOI3/340	0.75 0.70 0.90 1.15 0.65-1.35	0.55 0.40 0.20 0.26 0.10	0.17 0.17 0.11-0.23 0.13-0.25 0.17	0.45 0.48 0.37 0.29 0.25	200X 200X 400X 400X 400X	4.3 4.08 2.0 1.29 1.2	1.1 1.1 0.55 0.55 0.55	 Correction collar Correction collar Oil immersion/Iris

7 ASSEMBLY

7-1 Assembly Diagram

The diagram below shows the sequence of assembly of the various modules. The numbers indicate the order of assembly.

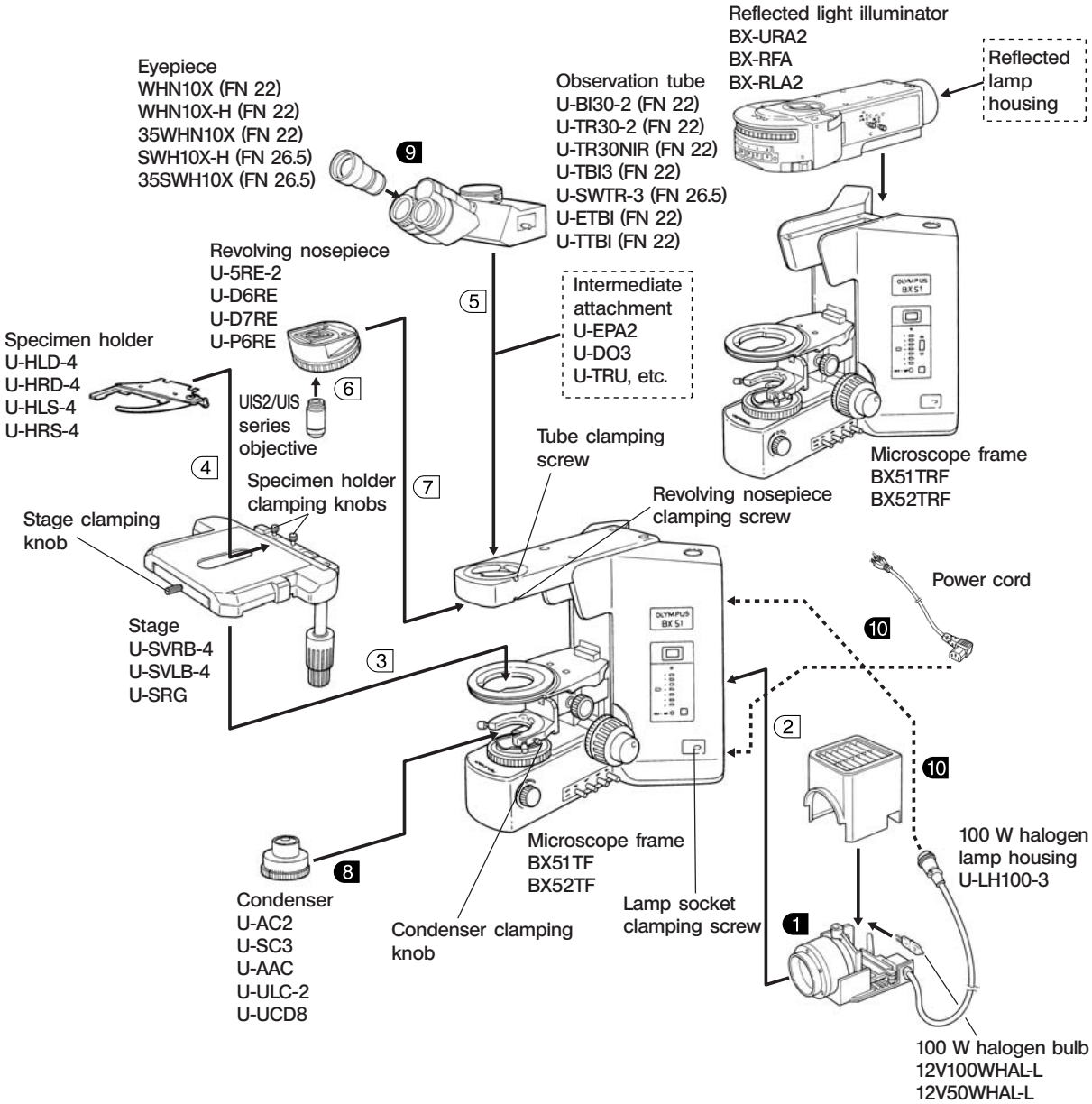
The BX51TRF and BX52TRF microscope frames are assembled in the same procedures as the BX51TF and BX52TF frames.

The module numbers shown in the following diagram are merely the typical examples. For the modules with which the module numbers are not given, please consult your Olympus representative or the catalogues.

★ **When assembling the microscope, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.**

Assembly steps enclosed in ■ will be detailed on the subsequent pages.

◎ Most assembly operations are possible by using the Allen screwdriver ( ) provided with the microscope. However, the assembly of the reflected light illuminator requires the use of the provided Allen wrench ( ) for clamping the internal screws (to ensure the performance, we recommend that you have your Olympus representative assemble or remove this module).



7-2 Detailed Assembly Procedures

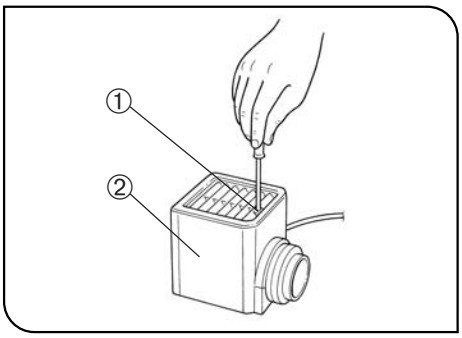


Fig. 35

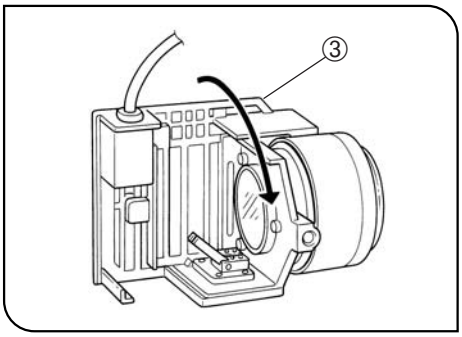


Fig. 36

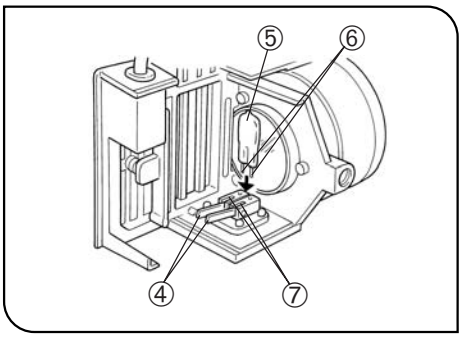


Fig. 37

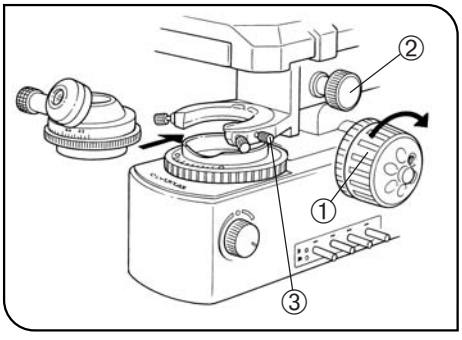
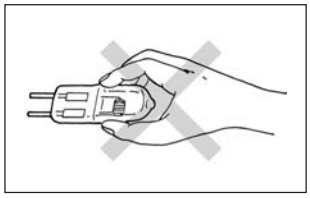


Fig. 38

1 Installing the Bulb (Figs. 35 - 37)

◎Use only the designated bulb 12V100WHAL-L (PHILIPS 7724) or 12V50WHAL-L (LIFE JC).

1. Fully loosen the lamp housing clamping screw ① on to of the lamp housing cover with the provided Allen screwdriver.
2. Lift the lamp housing cover ②upward to remove it.
3. Turn the lamp socket ③ by 90° in the direction indicated by the arrow.
4. Holding the bulb ⑤ with gloves or a piece of gauze, depress the bulb clamping lever ④ and insert the bulb pins ⑥ fully into the pin holes ⑦ on the lamp socket. Gently release the bulb clamping lever to the original position to secure the bulb.



⚠To prevent reduced bulb life or cracking, do not touch the bulb with bare hands. If fingerprints are accidentally left on the bulb, wipe the bulb with a soft cloth.

5. Side the lamp housing cover onto the housing base from the above. Tighten the clamping screw ① while pressing downward on the cover. (Fig. 35)

⚠Caution for Bulb Replacement During Use or Right After Use

The bulb and the lamp socket are areas near these will be extremely hot during and right after use.
Set the main switch to " O " (OFF), disconnect the power cord from the wall outlet, then allow the old bulb and lamp housing to cool before replacing the bulb with a new of the designated type.

8 Attaching the Condenser (Fig. 38)

1. Turn the coarse adjustment knob ① to raise the stage to its upper limit.
2. Turn the condenser height adjustment knob ② to lower the condenser holder to its lowest position.
3. Fully loosen the condenser clamping knob ③.
4. Position the condenser so that the aperture scale is located in front. Gently slide the condenser along the dovetail all the way until it is stopped.

◎When attaching the U-SC3 swing-out condenser, align the positioning pin at the back of the condenser with the groove in the condenser sleeve.

★When attaching a condenser with swing-out top lens, swing out the top lens out of the way before inserting the condenser.

5. Tighten the condenser clamping knob and gently raise the condenser holder to its highest position.

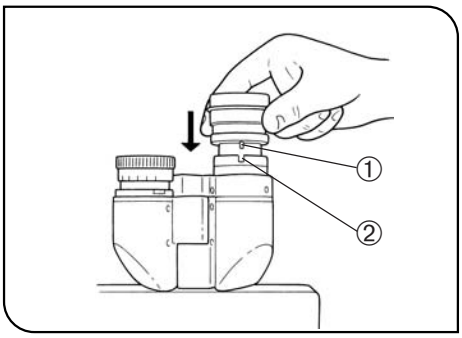


Fig. 39

9 Attaching the Eyepiece (Fig. 39)

★When using the U-BI30-2 binocular tube, eyepieces with built-in micrometer disk cannot be attached.

★When using a finder eyepiece or an eyepiece with micrometer disk, attach it to the right-hand eyepiece sleeve.
When doing so, make sure that the eyepiece positioning pin ① fits into the notch ② on the eyepiece sleeve.

★The super-widefield trinocular observation tube is equipped with a positioning notch on both eyepiece sleeves. Make sure that the positioning pins on both eyepieces fits into the respective notches.

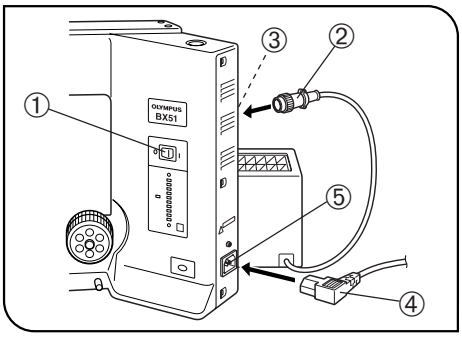


Fig. 40

10 Attaching the Lamp Housing Cable and Power Cord (Figs. 40 & 41)

⚠Cables and cords are vulnerable when bent or twisted. Never subject them to excessive force.

⚠Make sure that the main switch ① is set to " O " (OFF) before connecting the power cord.

1. Connect the lamp housing cable connector ② into the connector ③ on the rear of the microscope.
(The BX51TRF/BX52TRF have two connectors on the rear panel. With these models, the connector from the transmitted light lamp housing should be connected to the connector marked ⏄ and that from the reflected light lamp housing to the connector marked ⏄ .)

⚠Always use the power cord provided by Olympus. If no power cord is provided with the microscope, please select the proper power cord by referring to section " PROPER SELECTION OF THE POWER SUPPLY CORD " at the end of this instruction manual.

2. Connect the power cord plug ④ to the AC receptacle ⑤.

⚠The power cord should be connected to a grounded/earthed ,3-conductor power outlet. If the power outlet is not grounded/earthed properly, Olympus can no longer warrant the electrical safety performance of the equipment.

3. Plug the power cord plug ⑥ into the wall outlet ⑦.

⚠Should the power cord come in contact with the hot lamp housing, the power cord could melt and cause electric shock. Be sure to route the power cord away from the lamp housing.

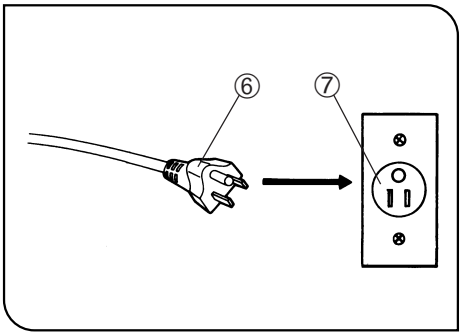


Fig. 41

PROPER SELECTION OF THE POWER SUPPLY CORD

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to " Specifications " and " Certified Cord " below:

CAUTION: In case you use a non-approved power supply cord for Olympus products, Olympus can no longer warrant the electrical safety of the equipment.

Specifications

Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60°C minimum
Length	3.05 m maximum
Fittings Configuration	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.

Table 1 Certified Cord

A power supply cord should be certified by one of the agencies listed in Table 1 , or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1. In case you are unable to buy locally in your country the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.

Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET, JQA, TÜV, UL-APEX / MITI	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA BSI	
Germany	VDE		U.S.A.	UL	
Ireland	NSAI				

Table 2 HAR Flexible Cord

APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or Embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)	Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)		
		Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC ‹HAR›	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	‹VDE› ‹HAR›	30	10	10
Union Technique de l´Electricite´ (UTE)	USE ‹HAR›	30	10	30
Instituto Italiano del Marchio di Qualita´ (IMQ)	IEMMEQU ‹HAR›	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC ‹HAR›	10	10	30
N.V. KEMA	KEMA-KEUR ‹HAR›	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO ‹HAR›	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	‹ÖVE› ‹HAR›	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	‹DEMKO› ‹HAR›	30	10	30
National Standards Authority of Ireland (NSAI)	‹NSAI› ‹HAR›	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO ‹HAR›	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	‹UNED› ‹HAR›	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT ‹HAR›	30	30	70
Instituto Portages da Qualidade (IPQ)	np ‹HAR›	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV ‹HAR›	10	30	90
Elektriska Inspektoratet	SETI ‹HAR›	10	30	90

Underwriters Laboratories Inc. (UL)	SV, SVT, SJ or SJT, 3 X 18AWG
Canadian Standards Association (CSA)	SV, SVT, SJ or SJT, 3 X 18AWG

MEMO

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